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GARBAGE DISPOSAL PLANT

ABSTRACT OF THE DISCLOSURE

A garbage disposal plant includes a pulverizer which reduces the garbage to particulate size. The particulate garbage in admixture with combustible material is fed to an incinerator wherein the mixture is incinerated to an ash which in turn passes to a crusher. The crusher reduces the ash to the desired particle size and the crushed material passes to a mixer to mix with other material to form construction material, such as asphalt. In this manner, all of the garbage fed to the plant is treated without the necessity of separation of parts thereof and the remaining ash is disposed of as a useful by-product.

and to methods of garbage disposal.

In many areas garbage is disposed of as land fill, but this is unsatisfactory due to an increasing lack of suitable available land area. Garbage dumps also encourage vermin and are generally unsightly and unsanitary. This has led to many alternative suggestions for disposing of garbage, often involving incineration. In many such suggestions, classification of the contents of the garbage has occurred into different constituents, such as vegetable and paper products, tin cans and glass bottles, for treatment in different manners. In substantially all of these prior art operations, some form of ash is obtained which is disposed of as land fill.

By contrast, the garbage disposal system of the present invention does not involve any separation of constituents and results in a useful product.

The present invention is illustrated by the accompanying drawings, in which:

Figure 1 is an elevational view of a garbage disposal plant according to the invention;

Figure 2 is a plan view of the plant of Figure 1,

Figure 3 is a detail of the plant of Figure 1, and

Figure 4 is a section along line 4-4 of Figure 3.

In the drawings, a garbage disposal plant 10 includes a dump hopper 11 leading to a feed chute 12. The hopper 11 has a safety screen 14 normally positioned over the open end thereof. The safety screen 14 is designed to open to receive garbage, typically from a dump-truck 16 and to close after the garbage has passed into the hopper 11.

It is not necessary to provide a safety screen 14, but it is preferred, so as to avoid accidental ingress of plant operators or the like into the hopper 11. The safety screen 14



may be actuated in any convenient manner, such as by a trip switch, shown schematically at 18, operated by the rear wheels 20 of the garbage truck 16.

Wood chippings, shredded bark and sawdust are added to the garbage in the hopper 11 by feeding such materials from a tree trimming and chipping unit 22 by feedline 24. Any convenient form of chipper or trimmer may be employed. Alternatively, a rotary saw may be provided to form sawdust from the wood.

10 Further, the garbage disposal plant may be located close to a supply of pulp and paper industry distress products, such as, sawdust and bark. These materials may be hauled to the garbage disposal plant 10, typically in dump-trucks, and discharged into the feedline 24. Another alternative involves using some distress material hauled to the site and some divided wood products formed on site from trees.

20 The garbage passes by chute 12 to a pulverizer 26, typically driven by a motor 28. In the pulverizer, the materials present in the garbage, such as organic and inorganic wastes, disposable package items, paper products, tin cans and glass bottles, etc., is reduced to particulate form. Pulverizers of various types are known and can be utilized to provide reduction of the garbage items to any particular size desired. The pulverizer 26 typically is provided with a removable screen 30, to allow cleaning or repair work to the pulverizer.

The resulting intimate mixture of reduced garbage and divided wood product is passed from the pulverizer 26 onto the surface of a moving conveyor belt 32 of an incinerator 34.

30 As an alternative, the wood material may be mixed with the garbage after reduction of the latter in the pulverizer 26. It may be advantageous to act in this manner, particularly in spring time, when wood cuttings tend to be sappy and the pulveri-

zer may become blocked, if the wood products are added prior to pulverization of garbage.

In certain locations, facilities may be provided to recover metals from the construction materials of tin cans. The particulate metallic material may be recovered from the intimate mixture by providing a magnetic separator between the pulverizer 26 and the conveyor belt 32. Usually, however, such metallic material is not separated from the remainder of the mixture.

10 The conveyor belt 32, generally in the form of a plurality of plates joined together to form an endless belt serves to convey the mixture through the incinerator 34 wherein combustion of the materials occurs. The conveyor belt 32 may be driven in any convenient manner, such as by motor 36. The speed of movement of the conveyor belt and hence of the mixture through the furnace may be controlled to the rate of burning of the material on the belt.

20 Oil burners 38 are provided located angularly to the conveyor belt 32 to provide a start-up to the combustion of the material in the incinerator. Once combustion commences, the presence of the divided wood material in the mixture will ensure a self-sustaining combustion. The combustion causes metallic and glass materials to melt and combusts other materials.

An air draft is provided to the incinerator 34 by counter weighted plate (not shown) which may be adjusted to provide any desired degree of draft.

30 The flue gas resulting from the combustion passes to the upper part of the incinerator. The flue gas passes into a passage-way 42 provided with a metallic screen 44, or other suitable filtering means, at the entrance thereof. The screen 44 removes a substantial quantity of dust and particulate matter from the flue gas, and any desired degree of fineness of mesh may be employed.

The screen 44 preferably is provided with means to re-

move periodically accumulated dust from the surface thereof, otherwise the ingress of flue gas to the passageway 42 is impaired. This removal of dust may be achieved by pivoting the screen 44 along the top surface thereof at 46 (Figure 3) and periodically moving the screen 44 to shake the dust therefrom. The removal of the dust is enhanced by the use of a steam spray directed from a nozzle 48 at the screen 44 to backwash the dust.

10 The steam spray has the added effect of dampening dust passing into the passageway 42 when the screen swings away from the entrance, causing such dust to drop back onto the conveyor belt. Any dust passing through the screen when the screen covers the entrance also is dampened by the steam and is prevented from passing out of the system. Further, the use of a steam spray directed into the flue gas stream has the added effect of partially removing therefrom noxious gases, such as chlorine and sulphur dioxide, so that corrosion of parts of the incinerator in the later path of the flue gases is minimized.

20 Actuation for the motion of the screen 44 may be provided in any convenient manner, for example, by a form of linkage to the conveyor belt 32.

The flue gases pass from the horizontal passageway to a vertical passageway from where the flue gases pass over a series of tubes 52 through which water passes. The heat in the flue gas heats the water and steam is formed, the tubes 52 therefore constitute a tube boiler.

30 Finally, the flue gases pass into a breach 54 and to a stack 56 where they are vented to atmosphere. The gas discharged to atmosphere is substantially free from dust and noxious gases. A further steam spray or electrostatic precipitators may be provided in the breach to substantially remove any dust remaining in the flue gas at this point.

The steam formed in the boiler tubes 52 may be passed

steam may be utilized as the source of steam for the spray 48, and for any auxiliary spray located in the breach 54.

Further, the steam may be used to wash out empty garbage trucks, and to provide heating for administrative buildings.

10 The draft plate 40 is removable from the end of the tubes 52, so that they periodically may be washed to remove deposited dust from the surface thereof. If such washing is not carried out, the accumulations of deposited dust may become such as to impair heat exchange or to impede the flow of flue gases longitudinally of the series of tubes.

The ash from the incineration passes out of the incinerator on conveyor belt 32 and drops into a crusher 54. Any convenient form of crusher may be employed, such as a rotating crusher or a swing jaw crusher. The crusher 54 is adjusted to crush the ash to the particle size required.

If it is desired to remove metallic materials from the crushed ash, the ash may be subjected to magnetic separation, prior to passage to the next stage.

20 The crushed material then passes, typically by means of an elevating conveyor 56 to a hopper 58. The crushed material may be fed from the hopper 58 to an asphalt mixing drum 60 supported on a frame 62. The quantity of crushed material fed is controllable by control 59.

Bitumen is fed from a storage tank 64 by means not shown to the mixing drum 60 wherein it is mixed in the desired proportion with the crushed material fed from the hopper 58. In cold weather it may be necessary to heat the bitumen, and such heating may be achieved by the use of steam formed in the boiler tubes 52.

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Here for the asphalt mixing drum 60 may be provided in suitable manner, such as by the provision of an oil burner unit 66. Asphalt of the required consistency is discharged from the mixing drum 60, typically by duct 68 to an asphalt laying truck 70, which then can transport the asphalt to the required location. The formation of asphalt from the bitumen and the ash forms the invention of copending application no.

104, 106, filed concurrently herewith.

Usually road making specifications require the use of two different types of asphalt, a coarse type and a fine type, used as top surface. Both types may be provided by the use of two hoppers 58. The crusher can be adjusted to provide fine or coarse crushed material. At one time the crusher may operate to provide the former material, which may be discharged to one of the hoppers 58 from the conveyor 56, while at another time the crusher may operate to provide the latter material, which may be discharged to the other of the hoppers 58. Then when it is required to make either of the forms of asphalt, material is fed from the appropriate hopper to the mixing drum 60.

The asphalt formed in this way is long wearing, has excellent body and provides good cushioning.

Alternatively, the crushed material may be used in concrete making, the concrete to be used in any desired manner.

A number of industrial operations generate slag which normally is simply used as land fill or accumulated as unsightly tips. Typically, industrial operations involving the formation of abrasives produce large quantities of slag.

Such slag may be hauled to the garbage disposal plant of the invention and fed to the crusher 54 to be mixed with the ash from the incinerator, and thereby is utilized to form asphalt.

If desired the slag may be mixed with the garbage at any other convenient stage in the operation, but is preferred to add it to the crusher, since the slag constitutes a dead load, if added at an earlier stage.

The slag profitably can be included in the crushed material forming the asphalt, since this material gives body to the asphalt.

It is apparent, therefore, that the present invention provides a garbage disposal plant to which all types of garbage may be fed, optionally together with waste slag from industrial processes, and from which is obtained a useful product, so that no material is discharged to land fill.

Modifications are possible within the scope of the invention.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A garbage disposal plant consisting essentially of, in combination, pulverizing means for reducing garbage to particulate size, incinerator means to incinerate material therein, feed means to feed said particulate size garbage in admixture with combustible material to said incinerator means, crushing means in communication with said incinerator means to crush ash received from said incinerator means to a desired size, mixing means, conveyor means located between said crushing means and said mixing means to convey crushed material from said crushing means to said mixing means, storage means for material which with said crushed material forms a construction material, and feed means to feed said material to said mixing means.
2. The plant of claim 1, wherein said incinerator means includes a lower burning zone and an upper zone, conveyor means located in said burning zone to convey material through said incinerator, passage means between said upper and lower zones, particulate matter filtering means positioned to remove particulate matter from gases entering said passage means from said burning zone, and a plurality of heat exchange tubes located in said upper zone.
3. The plant of claim 2 including steam spray means located in said passage means to discharge steam against said filtering means and into gases entering said passage means.

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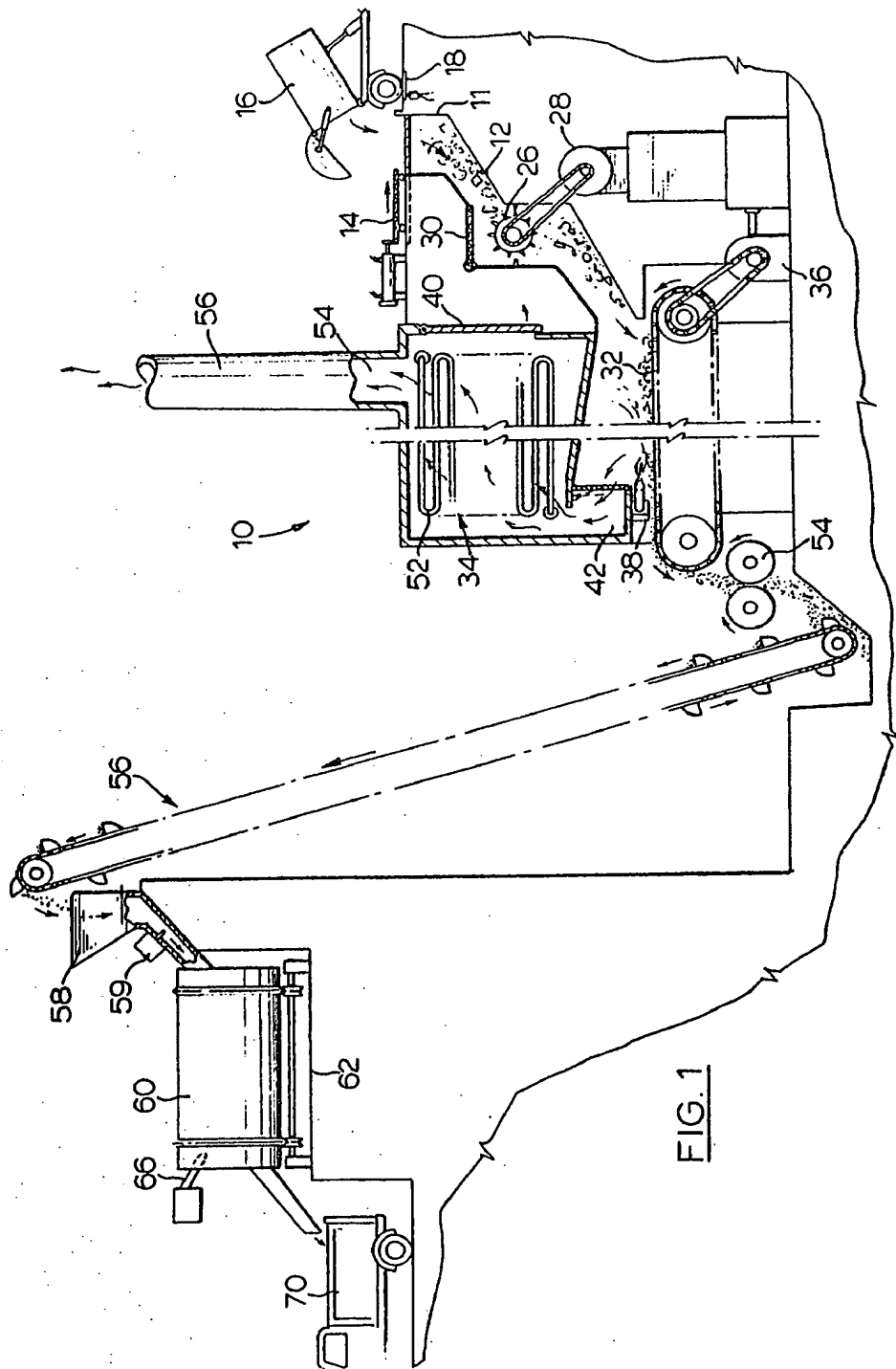
4. The plant of claim 2 including start up burner nozzles located in said burning zone.
5. The plant of claim 2 wherein said conveyor means includes an endless belt constructed of a plurality of plates.
6. The plant of claim 2 including means for varying the speed of said conveyor means.
7. The plant of claim 1 wherein said combustible material is particulate wood material, and including means for forming said particulate wood material.
8. The plant of claim 1 wherein said construction material is asphalt and including heating means associated with said mixing zone to heat said crushed material and bitumen in said zone.
9. A process for the treatment of garbage which consists essentially of providing garbage material without separation of its constituents, forming particulate garbage from said garbage material, forming a mixture of said particulate garbage with particulate combustible material, incinerating said mixture to form therefrom an ash, crushing said ash to form particulate ash and forming construction material from said ash, whereby all of the constituents of said garbage material ultimately are used to form said construction material.

10. The process of claim 9 wherein said combustible material is a wood material.

11. The process of claim 9 wherein said construction material is asphalt.



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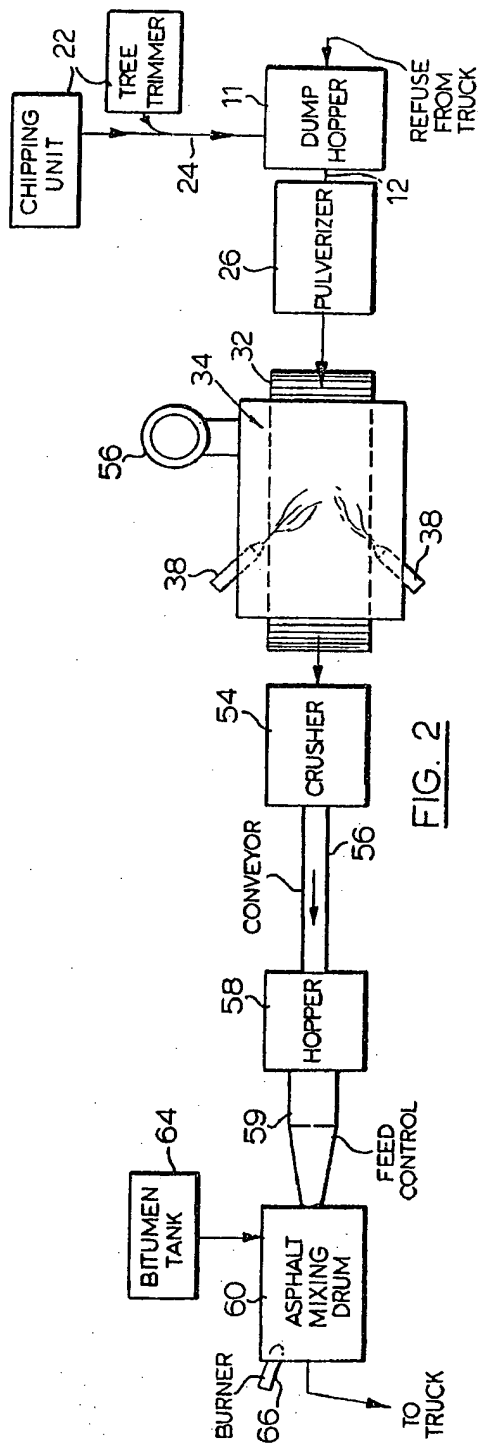


FIG. 2

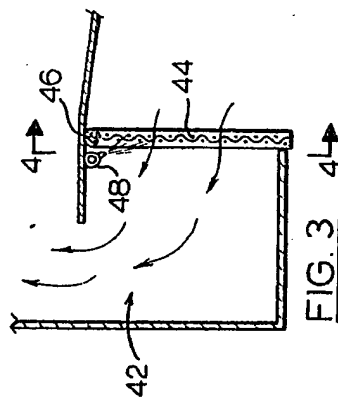


FIG. 3

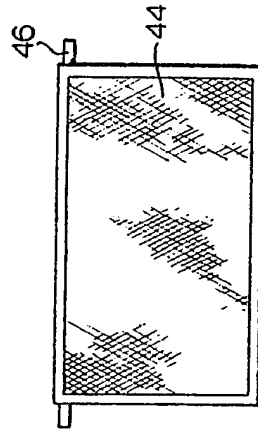


FIG. 4

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